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Birth-weight, adult blood pressure, and blood pressure reactions to acute psychological stress.

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Running head: Birth-weight and blood pressure

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The foetal origins of disease hypothesis contends that an unfavourable intra-uterine environment, as evidenced by low birth-weight, increases vulnerability to chronic illness in adulthood [1]. There is now reasonably consistent evidence of a negative association between birth-weight and adult blood pressure [2]. However, the mechanisms underlying this relationship remain unclear. It has been suggested that individual differences in susceptibility to stress may play a role [3]. One way of assessing this susceptibility is by measuring blood pressure reactions to an acute psychological stress task. There is evidence that large magnitude blood pressure reactions to such exposures predict elevated resting blood pressure at subsequent follow up [4]. The present analyses revisited the issue of birth-weight and adult blood pressure and examined whether any association was mediated by individual differences in blood pressure reactions to acute stress.

Participants, methods, and results

Data were collected as part of the West of Scotland Twenty-07 Study [5]. Participants were 560 adults (260 men, 300 women), not taking antihypertensive medication, aged 23 to 25 years old (mean age = 23.7, *SD* = 0.6 years), with a mean measured weight of 70.5 (*SD* = 13.5) kilograms. Birth-weight information, collected eight years earlier from the participants' mothers, was available for 533 of the participants; average birth-weight was 3359 (*SD* = 585) grams.

Testing sessions were conducted by trained nurses in a quiet room in the participants' homes. Systolic (SBP) and diastolic (DBP) blood pressure were determined by a validated semi-automatic sphygmomanometer at rest and twice during a 3-minute stress task, the paced auditory serial addition test, described elsewhere [4]. There is evidence that individual differences in reaction to tasks of this sort are stable over time and are associated with reactivity in 'real life' [6]. The task readings were averaged, and the resting baseline value subtracted to yield reactivity measures for SBP, and DBP.

Mean (*SD*) SBP and DBP at rest was 120 (15.0) and 73 (10.0), and mean (*SD*) reactivity was 10 (11.1) and 7 (9.0) mmHg, indicating that the task perturbed blood pressure ($p < .001$ in both cases). Given that men were heavier than women at birth ($p = .01$) and that the inverse association between birth-weight and adult blood pressure in

many studies is strengthened, or only becomes apparent, with adjustment for adult weight, hierarchical regression analysis adjusted for both sex and adult weight. In these analyses there was a significant association between birth-weight and adult SBP, but not DBP (see Table 1). In similar analyses, there was no association between SBP and DBP reactivity, ($\beta = .04$, $p = .40$ and $\beta = .02$, $p = .72$). In addition, the association between birth-weight and adult SBP remained significant following adjustment for reactivity ($p = .04$).

Comment

These analyses confirm the negative association between birth-weight and adult blood pressure. However, the association was significant only for SBP, was manifest only after adjustment for adult weight, and withstood additional adjustment for SBP reactivity. Thus, it would appear that it is differences in growth trajectory that predict variations in blood pressure. Individual differences in stress reactivity in the present study would not seem to play a mediating role, although the possibility of such mediation cannot be completely discounted on the basis of these data. In addition, the negative association between birth-weight and adult SBP was much weaker than the positive association between contemporary weight and SBP [2].

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Table 1: Birth-weight and Adult SBP and DBP: Final Models

	B	95% CI	β	p	ΔR^2
Resting SBP					
Step 1: Sex	-11.76	-14.02 to -9.24	-.39	<.001	
Adult Weight	0.32	0.23 to 0.41	.29	<.001	.334
Step 2: Birth-weight	-0.003	-0.004 to 0.00	-.08	.02	.006
Resting DBP					
Step 1: Sex	-2.46	-4.20 to -0.58	-.12	.008	
Adult Weight	0.24	0.17 to 0.31	.32	<.001	.149
Step 2: Birth-weight	-0.001	-0.002 to 0.00	-.06	.12	.004